

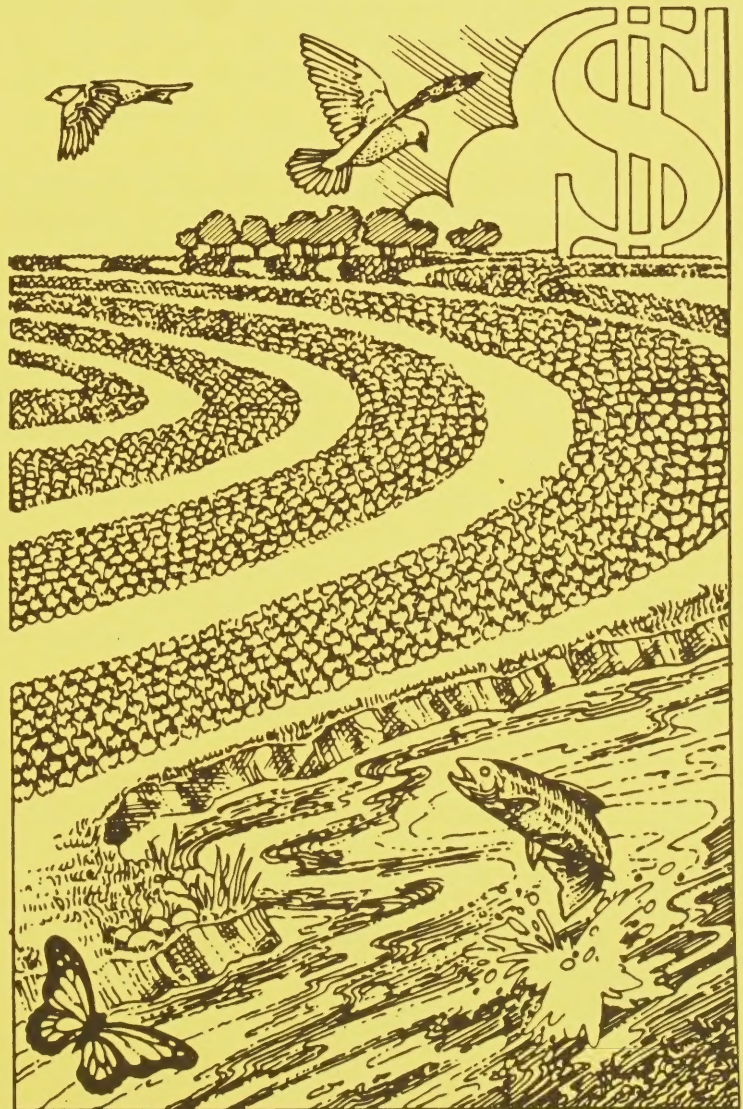
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MINNESOTA

North-Central Region Projects Supported by Sustainable Agriculture Research and Education Program



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Edited by

Steven S. Waller
University of Nebraska

and

J. Patrick Madden
University of California
from project reports

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Overview of Minnesota Projects

Congress has provided strong and growing support for the Sustainable Agriculture Research and Education grants program, also known as LISA (Low-Input Sustainable Agriculture). Administered by Cooperative State Research Service (CSRS), with the Cooperative Extension Service as a full partner, this program is forging partnerships between farmers, scientists, educators, agribusiness, non-profit organizations, and government -- a partnership that is beginning to promote better stewardship of the Nation's natural resource base. The program has supported 112 new projects since its inception in 1988; perhaps two dozen more will be funded by June.

Projects funded are typically carried out by teams of farmers, university research and education staff, government agencies, non-profit organizations, and private enterprise. Top priority is given to whole-farm integrated systems projects, usually including on-farm research and demonstrations. These projects are providing scientific documentation of low-input sustainable farming practices and systems, in comparison with conventional or chemical-intensive agriculture.

Farmer involvement is one of the strengths of this program. There has been active involvement in the administration of the North Central Region LISA program since its inception. Five producers from the region have served on the Administrative Council which develops policy and distributes funds. Six producers have also served on the Technical Committee which evaluates and recommends project proposals for funding.

Nationwide, 1,860 farmers have participated in projects during the first three years. When farmers participate in the planning and execution of a project, two important things happen. Concerns of farmers are foremost in the design of the project. And scientists get directly exposed to innovative ideas developed or tried by farmers. These ideas often become an integral part of scientific studies. The result is both better science and a more widespread adoption of more sustainable farming methods that are economically viable, socially acceptable, and environmentally sound, assuring cleaner water and a plentiful supply of safe food for generations to come.

The coordinators of Minnesota projects were asked about participating farmers. Here is what they reported:

- A total of 64 Minnesota farmers have participated in LISA research and education projects;
- All 64 are reported to have helped generate ideas for these projects, and they also help manage the projects;

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- 14 farmers have provided land for replicated experiments; another 22 provided land for unreplicated studies, and 30 for demonstration plots;
- 37 are helping with the evaluation of projects.

Projects Funded 1988-1990

Six projects funded by this program that include Minnesota scientists, farmers, or educators in major roles are described here. These projects received a total of \$1,112,935, and provided \$1,059,305 matching funds. In most of the projects, a scientist serves as the Project Coordinator. In others, a farmer or other local area residents are contributing to a multi-state project headquartered in another state.

The Middle Border On-Farm Research Consortium (LNC88-11)

Summary

The key participants in this project are more than 100 farmers in Kansas and Minnesota, working closely with members of private organizations and universities. The project is coordinated by Patrick Moore of the Land Stewardship Project in Minnesota. "The Middle Border On-Farm Research Consortium" includes the team members from the Kansas Rural Center, the Nebraska Sustainable Agriculture Society, and the University of Nebraska. The "Middle Border" area is defined as southwest Minnesota, eastern South Dakota, Nebraska, and northeast Kansas.

The distinguishing feature of this project is that the Consortium relies primarily on grass-roots input from local farmer networks to determine what research is to be done and how to carry it out. These emerging networks provide important social support to farmers attempting to make the transition from heavy dependence on synthetic chemical pesticides and other purchased inputs to low-input farming systems. The farmer networks also serve as focal points for technology transfer in disseminating scientific findings from experiment stations and other institutional research to farmers. The Consortium is bridging the gaps between farmers, researchers and private non-profit organizations in order to foster the widespread adoption of ecologically sound, profitable, and sustainable farming practices throughout the Middle Border region.

Now in its third growing system season, the Consortium's farmer networks are carrying out on-farm research and demonstrations on a wide variety of economically and environmentally sound farming practices such as the following:

- Assessing the farmer usability of an on-farm soil nitrate testing kit;
- Research and demonstration comparing the capabilities of raw manure, compost, and legumes to build and maintain soil fertility;
- Use of the rotary hoe rather than herbicides for control of weeds in row crop production;
- Overseeding of legumes as a winter cover crop and a spring plowdown green manure;
- The use of moisture conserving legumes in crop rotations and as interseeded crops with small grains.

Project Coordinator: Patrick J. Moore, Land Stewardship Project

Major Participants: Land Stewardship Project: A. Arner; University of Nebraska: C. Francis, NSAS S. Welsch; Kansas Rural Center: J. Jost

Farmers: Minnesota: L. Olson; Kansas: E. Reznicek

Project Duration: 3rd Year continuation of funding

Total Funding: LISA Funds: \$296,277; Matching Funds: \$338,895

Integration of Conservation Tillage, Animal Manures, and Cultural Pest Control In Corn (LNC88-1)

Summary

One potential cropping system that could reduce soil erosion, limit nitrate and pesticide contamination of groundwater, and improve farm profitability is ridge-tilled corn fertilized with liquid manures. Three major issues need to be addressed before we are certain that these benefits will accrue. First, what is the optimal amount of liquid manure to apply to corn given a past manure history to reduce nitrogen loss in ridge tilled corn? Second, under these rates of application, how much nitrogen is lost to leaching? Third, how are nitrogen leaching rates related to soil macropores in ridge-tilled vs. chisel-plowed corn? Fourth, how do the major pests (northern corn rootworm, European corn borer and foxtail) respond to manures in ridge-tilled corn, and can pesticide use be reduced when optimum rates of manure are applied?

There was no clear cut best system. Fertilization with synthetic nitrogen gave about 25 bu/a more yield, but also gave three to eight-fold greater nitrate leaching. There were no differences in rootworm injury. There was no difference in yield among tillages, but ridge-till gave 50 to 100% greater nitrate leaching. Although data from more years would need to be collected to substantiate these trends, our current data suggest that chisel plow is superior to ridge-till at this site because it presents less of a threat to ground water, and that liquid manure may be less profitable in short-term, but more environmentally sound than use of chemical fertilizer in this location and soil type. Further research is needed to determine whether the same results would occur with solid manure instead of liquid manure, and whether long-term changes in soil characteristics and productivity might eventually compensate for short-term financial shortfall.

Project Coordinator: David A. Andow, University of Minnesota

Major Participants: University of Minnesota: J. Moncrief, J. Swan

Farmer: Minnesota: D. Flueger

Project Duration: 2 Years

Total Funding: LISA Funds: \$98,500; Matching Funds: \$93,472

Substituting Legumes for Fallow in U.S. Great Plains Wheat Production (LNC88-10)

Summary

Wheat-fallow production systems have been used for nearly a century in the wheat producing Great Plains states of Kansas, Nebraska, North and South Dakota. In addition to moisture conservation, fallow is also practiced to mineralize nitrogen and control weeds. While stabilizing wheat yields on a bushel per-acre basis, fallow leaves a sizeable acreage idle each year and contributes to wind and water erosion. In other wheat producing areas of the world, such as Southern Australia, cereal grain/legume companion crop production systems are utilized to keep the soil covered, fix atmospheric nitrogen, reduce weed competition, and provide improved grazing potential. Recently, these systems have been explored in the U.S. Palouse and Northern Plains wheat production areas and have exhibited the potential to reduce agrichemical inputs, both conserve and improve the soil resource, and increase net return per acre.

The value of legumes in rotation and as companion crops is well documented in humid areas. Less is known and only limited success has been demonstrated in semi-arid condition with traditional species, such as sweetclover and alfalfa. Alternative species which use less water, such as black medic (*Medicago lupulina* L.), seem feasible in the spring wheat region of central North and South Dakota.

To further identify the potential of legumes replacing fallow in the wheat production areas of the U.S. Great Plains, a number of locations have been identified which represent a continuum of moisture stress, from the most humid (north and east) in North Dakota, to the most arid (south and west) in Kansas. In the most humid region, 10 farmers are cooperating to test alternative legumes (primarily black medic and sweet clover) and alternative legume management systems in large, replicated plots. These sites are serving as a research and demonstration source for utilization by an on-farm research coordinator from the Michael Fields Agricultural Institute, State Extension Services, and the Northern Plains Sustainable Agriculture Society. Small plot and feasibility research on black medic and other alternative legumes and production systems are being conducted on experiment stations by North Dakota State University at Carrington, University of Nebraska at North Platte, and by Kansas State University at Tribune. On-farm sites will require from two to four years to assess the value of the self-perpetuating black medic.

Project Coordinator: John C. Gardner, North Dakota State University
Carrington Research Extension Center

Major Participants: North Dakota State University Carrington: B. Schatz,
V. Anderson; NDSU: D. Watt; Wisconsin Michael Fields
Institute: S. Guldán; Kansas State University: J. Havlin,
A. Schlegel; University of Nebraska: R. Klein

Farmers: North Dakota: D. Podoll, K. Ableidinger, C. Nelson,
D. Dufner, T. Jacobson, D. Thomas, B. Neevel,
E. Haakenson, D. Montgomery; Minnesota: C. Fernholz

Project Duration: Started in 1988; now in fourth year.

Total Funding: LISA Funds: \$341,000; Matching Funds: \$271,139

Performance and Economics of a Low-Input Feeder Swine Operation (LNC88-20)

Summary

The project involves the construction and study of an alternative swine housing unit. The project compared 20 sows in the alternative environment to 20 sows in a conventional confinement system. Pigs were of identical genetics and age. The same farmer managed both systems. The two systems were compared in terms of biological and economic performance.

The alternative system consisted of 3 pens located in an un-insulated, naturally ventilated pole barn. Two pens were used to house gestating sows, while the third pen was used to house farrowing-lactating sows and weaned pigs.

Each pen had a super-insulated waterer that required no energy. Gestating sows were fed on a "skip-a-day" system, while lactating sows were given free access to feed. A one foot-deep bed of straw provided insulation for the piglets and allowed sows to exercise nesting behavior. One week before the farrowing dates, farrowing cubicles (made out of plywood sheets) were placed in the pen to avoid excessive cross-fostering and prevent piglet-crushing. The cubicles were removed when the piglets were one week old. Piglets were weaned at 4-6 weeks of age and either stayed in this pen until 7 weeks old or were moved to another pen.

Preliminary conclusions from the economical analysis indicate:

- (1) The capital investment was 30% higher for the conventional system than for the alternative system.
- (2) Fifty percent of the capital investment of the alternative system was the cost of labor performed by the farmer and her family.
- (3) The monthly operating expenses for the alternative and conventional systems during the first 6 months was \$666 and \$831, respectively. Energy expenditures account for much of the difference observed.
- (4) The amount of labor required for the alternative system was 10% higher than in the conventional system. Some activities in the alternative system, such as pig processing, required the presence of several people.

- (5) An increase in feed consumption by sows in the alternative system was observed during the winter months. This could be explained by an increase in energy required by the sows to compensate for the cold weather conditions.

This alternative system minimizes the major inputs used in confined units: Capital expenditures, energy utilization and drug usage were reduced, and no feed antibiotics were used. Finally, animal welfare is enhanced through the use of open areas, and straw, with no crates.

Project Coordinator: Carlos Pijoan, University of Minnesota

Major Participants: University of Minnesota: L. Jacobson, J. Pettigrew, V. Eidman

Farmer: Minnesota: A. Olson

Project Duration: 2 Years

Total Funding: LISA Funds: \$63,800; Matching Funds: \$124,229

Rotational Grazing Systems for Wisconsin and Minnesota Livestock Farmers: An Evaluation of Animal and Forage Performance and Whole Farm Socio-Economic analysis (LNC90-27)

Summary

Rotational grazing (RG) systems have the potential to improve the economic viability for many dairy farmers in Wisconsin, Minnesota and other North Central States. RG can reduce building and machinery costs, as well as reduce annual crop input expenses over confinement systems that rely mainly on row crop production for cattle feed. A significant environmental benefit is possible from keeping land in permanent cover, and replacing chemical-intensive corn and forage crops with rotational grazing of pasture.

The on-farm portion of the project will involve 3 clusters of farmers (2 in WI; 1 in MN) who are experienced in using RG systems. Information will be collected to evaluate performance of perennial grasses, pasture establishment methods, and effects of RG on yields of forage; milk; and animal health, and the farm family. An in-depth financial analysis of 6 farmers will allow comparison of RG and confinement systems. Decision case studies, a means of whole-farm analysis, will be developed.

Replicated experiment station trials will be conducted at Arlington, WI and at Rosemount, MN. The Wisconsin work will focus on forage and cow performance with RG of alfalfa and legume-grass pasture as compared to confinement systems. Alfalfa varieties and ration balancing will also be evaluated. The Minnesota work will examine the effects of stocking rates on animal gains and legume persistence using RG as compared to conventional continuous grazing systems.

Outreach for the project will be coordinated through the Wisconsin Rural Development Center and the Land Stewardship Project. It will consist of yearly field days and workshops, a video tape production, and a major two-state conference on RG for farmers and researchers.

Project Coordinator: Craig Sheaffer, University of Minnesota

Major Participants: University of Minnesota: K. McNamara, K. Olson, N. Martin; University of Wisconsin: K. Albrecht, M. Casler, S. Stevenson, D. Combs, R. Klemme; Land Stewardship Project: R. Ness; Wisconsin Rural Development: D. Caneff; So. Wisconsin Farmers Research Network: C. Fredericks

Project Duration: 2 years. With funding from September 1, 1990 to September 1, 1992.

Total Funding: LISA Funds: \$118,708; Matching Funds: \$72,320

Agronomic and Economic Analyses of Alternative Small Grain/Row Crop Production Systems for the Northern Plains (LNC88-9)

Summary

This project is a continuation of a long-term investigation of alternative, low-input agriculture initiated in 1984 by South Dakota State University. The overall objective of this multi-disciplinary effort is to compare the agronomic and economic sustainability of alternative, conventional, and reduced-tillage farming systems. The alternative systems use primarily on-farm resources to meet crop nutrient needs and to control pests. One complete cycle of all crop rotations in the replicated experimental systems was completed in 1988. Investigations include agronomic and whole farm economic analyses of the experimental farming systems and also of producers' systems.

Objectives

- (1) Measure inputs, yields, soil physical and biological properties, earthworms, mycorrhizal associations, and pests. Farming systems are being modeled to determine whole farm impacts in regard to labor and managerial requirements, farm production costs, profits, solvency, and liquidity.
- (2) Estimate the effects of different livestock enterprises, Federal Farm program provisions, crop yields and prices, and agrichemical prices are included in the models.
- (3) Analyze transition effects and of comparisons of alternative and conventional farms will be completed.
- (4) Continue networking with Minnesota, Montana, Nebraska, and South Dakota, and the Northern Plains Sustainable Agricultural Society.
- (5) Continue extending information through field tours, progress reports, producer/research workshops, media news releases, newsletters and journals.

Project Coordinator: James D. Smolik, **South Dakota State University**, Plant Science Department, Box 2109, Brookings, SD 57007

Major Participants: **South Dakota State University:** George Buchenau, Thomas Dobbs, Diane Rickeri, Donald Taylor, and Leon Wrage

Cooperators: **University of Minnesota:** Kent R. Crookston; **North Dakota State University:** John C. Gardener; **South Dakota State University:** Robert G. Hall, David D. Walgenbach; **University of Nebraska:** Warren W. Sahs; **Montana State University:** James R. Sims

Conventional Farmer: **South Dakota:** Kris Johnke

Low-input Farmers: **South Dakota:** Allan Johnson; Charles Johnson; **North Dakota:** Fred Kirschenmann, President of Northern Plains Sustainable Agricultural Society, Windsor, ND

Project Duration: Started 1988, now in fourth year.

Additional Funding: September 1, 1992

Total Funding: LISA Funds: \$194,650; Matching Funds: \$159,250

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